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A background Study for Joint Implementation in China and Indonesia

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Abstract

This paper discusses the importance of institutional barriers in promoting reforestation as a means of mitigating global climate change. It is argued that cost-effective implementation of reforestation depends on proper institutional settings in host countries. The study is motivated by the growing interest for reforestation projects in developing countries through the Joint Implementation (JI) mechanism. Particular emphasis is given to the role of property rights. The relationship between various stakeholders, such as governments, NGOs, the private sector, and international aid agencies is analyzed. Discussed aspects include conflicts among stakeholders, long-term security or stability of property rights regimes, distribution of property rights, and information exchange. The forest situation in China and Indonesia is used as an illustrative example.

The study outlines a number of conflicts in the property rights regime which need a better understanding. Important questions for further research include: (1) What are the underlying conditions that affect the design and implementation of reforestation programs? (2) Who are the main actors involved in forest management, and which are their respective roles and motivations? (3) To what extent and in what ways do property rights affect the cost-effectiveness of reforestation efforts? (4) What policy instruments can be developed or improved to facilitate reforestation programs? and (5) What are the relevant institutional frameworks and/or arrangements to be used in JI for reforestation programs? What institutional changes would be brought up through such programs?

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1 Introduction

Reforestation is a priority issue in the policy agenda in both developed and developing countries. This issue is particular relevant to developing countries, due to their faster rates of deforestation (Allan and Lanly, 1991, p.30). Nested within the debates surrounding global climate change, reforestation is emerging as both a promising and controversial solution.

Optimists view reforestation as a cost-efficient strategy to sequester CO_2 and mitigate climate change (Brown, 1996, pp.775-76). It is therefore seen as an interesting option for countries seeking ways of fulfilling their obligations to the Kyoto protocol of the Climate Convention (UNFCCC). The Kyoto protocol may open for crediting of carbon benefits of projects in other countries through "Joint Implementation" (JI) and mechanisms such as the Clean Development Mechanism (CDM).

Reforestation in developing countries is seen as particularly attractive, due to high tree growth rates and low costs compared to similar measures at higher latitudes (Brown, op.cit., pp.787-89). Reforestation has also been proposed as a means of offsetting high rates of deforestation in tropical countries. Nevertheless, critics question the long-term CO_2 benefits of reforestation, and argue that such efforts may give negative environmental and socio-economic impacts.[1]

Consequently, reforestation has become entangled in debates about climate change mitigation strategies and carbon accounting methodologies. While the Kyoto protocol may lead to increasing demand for carbon sequestration in the years to come, few studies have explored the institutional implications of reforestation projects in developing countries.

Furthermore, the significance of these institutional factors has seldom been considered in relation to the diverse stakeholders involved, which can be expected to have very different interests related to reforestation. Examples of stakeholders are local communities, landowners, pulp and paper companies, conservationists, national governments, international investors, international aid agencies, and climate change research institutions.

In this paper, we first present some background on reforestation, climate change and Joint Implementation (Chapter 2). We then discuss what we consider a "missing link" in studies on reforestation projects, namely institutional aspects (Chapter 3 and 4). The discussion is focused on the extent and means property rights affect implementation and long-term success of reforestation efforts[2,3]. Four aspects are emphasized: (1) emergent conflicts among various stakeholder groups, (2) long-term security or stability of property rights regimes, (3) distribution of property rights, and (4) information exchange. These issues are

[1] Large-scale plantations in particular are met by scepticism. Such plantations could sequester large amounts of carbon over a short time period, and be very profitable for the investor. However, technical risks are great, and social resistance is often high and the environmental soundness is generally low. Using these in a joint implementation project may, in fact, contradict the objectives of the Climate Convention.

[2] The aim is to reveal any "hidden costs" arising from the property rights regime in carbon sequestration projects. Property rights could affect establishment and maintenance costs, i.e., both at short-term and long-term costs.

[3] "Success" can be defined according to several criteria, including financial viability for the actors involved, social acceptability, and environmental sustainability. It is important to note that success for the donor country does not necessarily equate with success in the host country.

considered critical in evaluating the potential of reforestation as a mitigation measure for climate change.

In Chapter 5, China and Indonesia are presented as illustrative case studies. Despite differences in their political and socio-economic systems, the two countries share several common features in their development. First, they are both countries with large land areas suitable for reforestation, thus a large potential for carbon sequestration. Second, they both have centralized government control and bureaucratic systems and relatively marginal private ownership over lands. Third, both countries have already initiated ambitious programs for reforestation.

The main objective of these programs is to secure future supplies of forest resources in a situation with declining natural forest areas, but also to increase agricultural productivity, e.g., through agroforestry practice, protect watersheds, control soil erosion and reduce desertification. In the conclusion, main issues and questions for future research are presented.

2 Reforestation, Climate Change and Joint Implementation

2.1 Reforestation and Climate Change

Reforestation could mitigate human-induced climate change through carbon sequestration, i.e. uptake of CO_2 and storage of carbon in biomass, soils and wood products. The term reforestation normally describes the establishment of forests on lands that have been cleared in recent times.

When forests are established on what was previously non-forested land, the term *afforestation* is more appropriate. FAO (1997) defines afforestation as "the establishment of a tree crop on an area from which it has always or very long been absent." While reforestation in some areas, e.g. parts of China, is technically considered afforestation, in this paper we use the term reforestation because our emphasis is on tropical forests that have been cleared in recent times.

Reforestation covers a variety of forest types, ranging from monoculture forest plantations to highly diverse and complex agroforestry systems. Methods for reforestation involve both planting and natural regeneration. It is assumed that natural regeneration of secondary forests over time would sequester most of the carbon dioxide that was released in the deforestation process. However, this process may require a century or more. Planting of fast-growing tree species could be one way of accelerating the carbon uptake of forests.

Studies vary as to how much carbon could be sequestered and over how long time. Based on two global studies (Nilsson and Schopfhauser, 1995; Trexler and Haugen, 1995), Brown (1996) estimates the total potential for conserving and sequestration carbon at between 60 and 87 GtC for the period 1995-2050. This is equivalent to about 12-15 % of total fossil fuel emissions over the same period in a "business as usual" scenario. Measures include slowed deforestation, forestation, agroforestry, and natural and assisted regeneration. This estimate assumes an area availability of 700 Mha. Forestation (includes both afforestation and reforestation) account for about 42% of the total (31 GtC).

2.2 Reforestation and Joint Implementation

In recent years, many countries have developed an interest in supporting reforestation programs, including programs outside of their countries. This interest is based on the premise that it would be cheaper to sequestrate carbon in other countries than to reduce emissions by direct national actions, assuming that it is possible to obtain credit for such projects.

The mechanism for transferring emissions reduction credits between countries is through Joint Implementation (JI). The principle of JI originated in the 1992 United Nations Framework Convention on Climate Change (FCCC), which states that "Parties may implement … policies and measures jointly with other Parties". The JI approach is based on

the premise that countries with high emission reduction costs (typically industrialized countries) may invest in GHG-reducing efforts in low-cost countries (typically developing countries), thereby obtaining credits for achieved emissions reductions.

There is considerable discussion both about JI as an implementation mechanism and its applicability to reforestation in tropical countries. Under the FCCC negotiations, a pilot phase for JI efforts is now in progress (1995-1999). JI projects under the pilot phase are officially referred to as Activities Implemented Jointly (AIJ). AIJ projects in the forest sector are being implemented in countries, such as Costa Rica, Mexico, Russia, and Indonesia. The future development of JI will, to a large extent, depend on the experiences of AIJ during the pilot phase.

The future of JI was not fully addressed at the third Conference of the Parties (COP-3) held in Kyoto, Japan in December 1997. The Kyoto Protocol to the Climate Convention may provide opportunities for crediting carbon offsets through the Clean Development Mechanism (CDM). The CDM will enable companies in the developed world to enter into cooperative projects to reduce emissions in the developing world, e.g., reforestation or the construction of high-tech, environmentally sound power plants, for the benefit of both parties. Companies will thus be able to reduce emissions at lower costs than they could at home, while developing countries will be able to receive the kind of technology that can allow them to pursue sustainable growth.

The CDM will certify and score projects, and also allow developing countries to bring projects forward in circumstances where there is no immediate developed country partner. Under this mechanism, companies may choose to either make investments in projects or to buy emissions reductions.

JI has been largely promoted by industrialized countries in order to reduce the overall costs of carbon mitigation in their own countries. From the perspective of developing countries, motivating factors for reforestation include opportunities for attracting private sector funds, facilitating technology transfer and other social and environmental benefits (Chatterjee, 1997, p.81). Countries in favor of JI argue that, in addition to being a vehicle to promote cost-effective GHG reductions, JI could have a number of 'spin-off' effects:

1) push for stronger future commitments for Annex I countries;[4]
2) create incentives for the involvement of the private sector in dissemination and application of appropriate technologies;
3) help developing countries being more actively involved in the implementation of the Climate Convention; and
4) provide incentives for additional investment flows into developing countries.

Although JI is still in a pilot phase, its role as a strategy for addressing climate change has come under extensive criticism (Harvey and Bush, 1997, p.17). JI has been met with considerable skepticism mainly, but not exclusively, from developing countries. Critics argue that JI could be a way for industrialized countries to "buy their way out" of emission reductions. Furthermore, it could be a negative incentive for technology development, for example, to replace existing fossil fuel technologies. Industries from the power sector are

[4] Countries listed in Annex I to the Convention include industrialised countries and countries with economies in transition (EIT).

pushing carbon sequestration as the CO_2 mitigation strategy of choice. The reality is that carbon sink enhancement will do little to tackle the root causes of either climate change or global deforestation.

As a solution to climate change, carbon forestry is not the equivalent of cutting the consumption of fossil fuels. First, carbon sequestration will not reduce the emission of other atmospheric pollutants such as those that cause acid rain. Second, carbon sequestration is more difficult to measure than emissions cuts. Third, carbon storage is only temporary if the forest is harvested. Finally, plantation forestry, the cheapest way to reduce CO_2 levels, is harmful to biodiversity and indigenous peoples who depend on natural forests.

The success of JI ultimately depends on the creation of appropriate and rigorous criteria that will ensure the maximum environment, development and social benefits, while remaining attractive to investors and implementers. To resolve ambiguities related to the concept, several criteria have been established for reforestation programs for carbon sequestration. Criteria that are common to most programs are: 1) additionality, e.g., many forestry programs cannot be established without external financial support; 2) social acceptability that fits into local needs; 3) economic viability, and 4) ecological sustainability. For reforestation projects in particular, there is a need for considering how long-term social and environmental benefits could be secured.

2.3 Current research on JI/AIJ

Scientific understanding of the implementation mechanisms for JI/AIJ is still limited. We know little about the dynamic forces that drive the development and implementation of JI/AIJ. Currently, international trade in GHG has drawn major attention, with research focusing on baseline and methodological issues as to how to quantify greenhouse gas offsets through JI/AIJ projects. Issues related to quantification, certification and verification of GHG offsets have been studied, particularly on sectoral issues at the project level (Chatterjee, 1997 and Michaelowa, 1997).

Specific methodological issues include criteria for project selection and assessment, as pointed out by Karani (1997, p.247):

- Credibility of the additionality of GHG emissions reduction from the project.
- Number of GHG sources and sinks to be reported.
- Adequacy of arrangements for monitoring, assessing and evaluating GHG emissions reductions.
- Facilitation of realistic discussions on pricing and distribution of implicit credits.
- Adequacy of assessment of project risks and measures to address negative outcomes.

Financial arrangements and mechanisms for JI have also been emphasized. Embree (1996) describes the potential role project financing will play in the JI market. The paper identifies several financial mechanisms that can facilitate the financing of JI projects and contribute to risk management of JI investments. Michaelowa and Greiner (1996, pp.231-252) discuss the complications that arise when designing JI incentives for companies at the national level. Not only should focus be put on the efficiency of incentive structures, but, they point out, issues

in public choice should also be taken into account. This mostly refers to the roles of different interest groups, particularly NGOs.

It was stressed in Parikh (1995, pp.22-41) that although JI can be beneficial to both the investing country and host country participants, care should be taken that projects are set up in line with the development priorities of the host countries. An interesting point in the article is the distinction between the trade mode and the benevolent assistance mode of co-operation between investor and host countries. The first mode reflects a situation where investor pays a market equilibrium price, which is higher than the 'fully agreed incremental costs'. In return, the investor receives carbon offsets (credits). Examples of second mode projects are the GEF projects, where costs are paid equal to the incremental costs, but no offsets are expected in return.

Apart from the attention to technical and methodological issues in JI/AIJ research, studies of social and economic impacts of JI projects have received considerable attention, such as displacement from impoundment areas or enclosure of reforested areas. These impacts are particularly severe in the forest sector with afforestation or reforestation projects (Cullet and Kameri-Mbote, 1997, pp.394-397). This is an important dimension, releasing the potential impacts of AI/AIJ projects to local communities and people.

Impact assessment of JI/AIJ is considered an important dimension. However, the dynamics of social and human factors in shaping the design and implementation of JI/AIJ projects have been, to a large extent, ignored. Zhou, Li and Intarapravich (1995) discuss options for developing institutions for JI projects. The evaluation is based on four sets of governmental and international criteria for JI projects, and the experience of ten JI pilot projects.

What is less emphasized is factors that condition the behavior of stakeholders. For example, the factors that drive private sector's interest and its involvement in JI/AIJ activities should be better understood. We also need to understand the mechanisms through which closer co-operation could be made between parties and local participants. It is expected that there are uncertainties in policy incentives provided by host developing countries, which undermine cost-effective project implementation. Therefore, qualitative analysis of institutional conditions for JI/AIJ activities at host countries present a great challenge for researchers.

Several initiatives are underway at the national and international levels to test the credibility of JI/AIJ. In 1996, the Wuppertal Institute for Climate, Environment and Energy undertook a research on Institutions and Procedures to Implement JI. The Twin Cycle System approach was used in the study. The role of national institutions as intermediary bodies is examined. Activities that absorb carbon, such as planting trees, will be offset against emissions targets.

The treatment of these so-called "sinks" was another controversial issue at Kyoto conference. Many countries wanted sinks to be excluded. The United States insisted that they be included in the interest of encouraging activities like afforestation and reforestation. Accounting for the role of forests is critical to a comprehensive and environmentally responsible approach to climate change. It also provides the private sector with low-cost opportunities to reduce emissions.

In 1997, the EU started a research project on accounting and accreditation of JI projects under the UNFCCC and the Oslo Protocol. The objective of the study is to examine the concept of JI as an instrument to the fair and efficient abatement of GHGs. It focuses on

economic efficiency, environmental effectiveness, social impacts, institutional feasibility, and intertemporal equity. The focus is on accounting for emissions reduction under a counterfactual baseline, and the complexities associated with assigning credit to donor countries.

While discussions of emissions trading, joint implementation and clean development mechanisms are central to establishing future relationships between reforestation and climate change, it is the implementation of such projects that is critical to determining its future role in climate change mitigation. While much attention has been given to the technical, economic and ecological aspects of reforestation programs, we argue, the institutional aspects represent a missing link in climate change mitigation debates.

3 Institutional Dynamics: The Missing Link

There is an inadequate understanding of JI/AIJ as a social institution related to climate change mitigation strategies. Two distinct factors may explain the lack of focus on institutional aspects. First, global environmental research has been largely defined by natural scientists. This is evident in a number of international programs, including the Intergovernmental Panel on Climate Change (IPCC) and the International Geosphere Biosphere Program (IGBP). Such programs tend to emphasize data collection and quantitative analysis, modelling and technology assessment (TA). Meanwhile, inadequate attention has been given to the underlying social, political, cultural and institutional factors that condition natural phenomena and decision-making processes.[5]

In fact, it has only been in the last several years that social scientists, particularly political scientists, economists, geographers, and to a lesser extent, scholars from the humanities and law, have developed a research agenda related to the human dimension of global environmental problems and policies.[6] These research initiatives attempt to bridge the gap in the social understanding of the dynamics of the human response to global environmental problems and policymaking.

Second, there is a structural constraint in the social study of global environmental issues. Too often, researchers are restricted by their disciplinary boundaries, or by webs of their knowledge structures (Price, 1992, pp.178-79). Research on human dimension is dominated by specialists within individual disciplines, such as political scientists, sociologists, anthropologists, etc. This disciplinary orientation has produced limited efforts to look into roles and dynamics of institutions in development from an interdisciplinary perspective. Consequently, the dynamic of international and national institutions for the global environment has been less studied than questions related to international development assistance and North-South co-operation.

As a consequence of these two factors, knowledge on the discourse of global environmental institutions is still limited and inadequate. We know little about the preconditions and determinants that shape the behavior and policymaking processes of governmental institutions and international aid agencies. In particular, there is insufficient understanding about the causes of interaction and conflicting interests among institutions, because of their differences in political priorities, sectoral interests, economic preferences, and power relations. To address to this challenge, there is a need to cross-disciplinary boundaries and develop alternative tools of analysis.

[5] It is important to note that the Working Group III of the IPCC has devoted considerable attention to the social and institutional issues that shape the global environmental problems.

[6] The importance of the social science understanding of institutions is stressed by Haas et al. (1993, p.viiii) in their book "*Institutions for the Earth*": Social science should have a role to play in answering these questions. Yet most scholarly analysis of international environmental policy has understated the institutional dimensions. Policy content has been stressed at the expense of policy process, and little or no systematic attention has been paid to the international institutions that must shape that process.

4 Analytical Framework

Institutional factors provide both incentives and obstacles to the successful implementation of reforestation programs. Factors that need to be considered include property rights, state capacity, and the distributional consequences of reforestation efforts. We are particularly interested in the underlying institutional issues involved in the complex interplay of environmental and resource politics, forest management, economic dynamics, technology innovation, financial and legal systems.

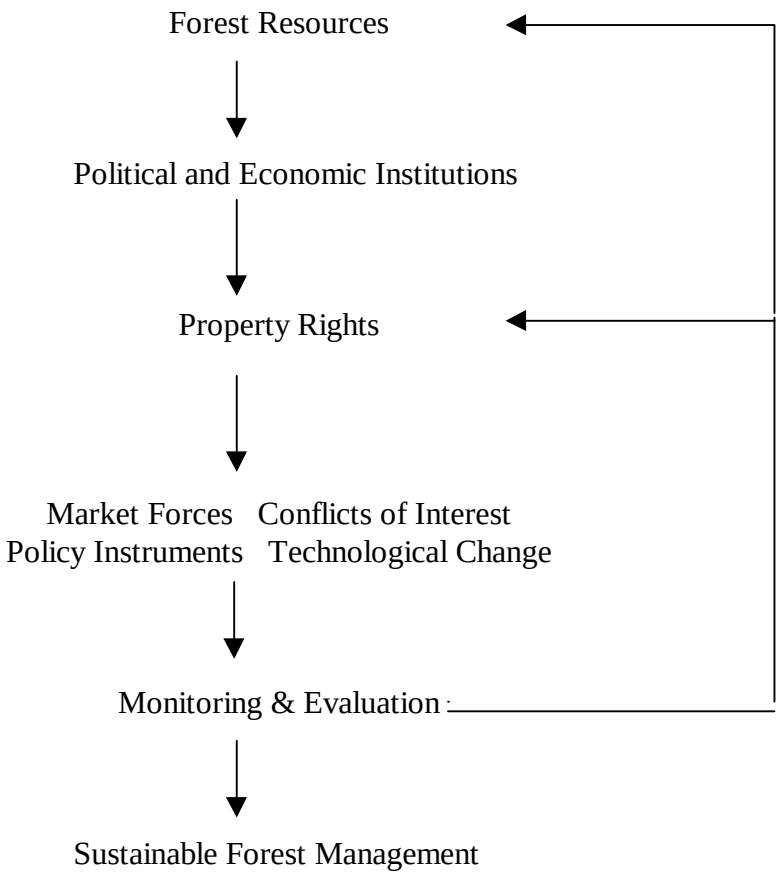
What needs to be better understood is how the issue of forest management is perceived and operated at the national, regional and local levels, and in what ways international institutions and financial transfer mechanisms can be cost-effectively linked to national, regional and local systems of forest management. Would bottom-up approach in project implementation be more effective than top-down approach, or vice versa? Through what ways can private interest in the forest sector be better mobilized, which may be in consistence with public interest?

There is an inadequate understanding of the driving forces and key actors that shape reforestation policies in developing countries. Given the variations in traditions, cultures, economic and political conditions, prescribed models of reforestation from industrialized countries may not be relevant for developing countries.

It can be argued that within the context of reforestation programs, potential conflicts exist at a variety of levels. They include: (1) conflicts of property rights (public vs. private), (2) conflicts of interest (international, national, regional, sectoral and individual); (3) conflicts of market (supply vs. demand); (4) conflicts of policy objectives (short-term vs. long-term); (5) conflicts of selecting policy instruments (command-control vs. market-oriented); (6) conflicts of technological choice (costs vs. efficiency), and (7) conflicts of sectoral objectives (biodiversity vs. climate change vs. industry).

Property rights is one of the institutions under political and economic conditions, from which various conflicts arise and resolved. The arrows indicate the feedback process, through which critical messages are taken into consideration in policymaking in order to increase cost-effectiveness in forest management.

Figure 1: The Relationship of Pursuing Sustainable Forest Development



4.1 Actors and Institutions

In the analysis of the relationship of social institutions that shape global environmental discourse, we can distinguish three interrelated actors: NGOs, governments (central/local) and the private sector. Institutions function through means of acting and reacting. Each institution has its own identity, which defines rules and principles. Institutional identity is established within social and cultural settings. It can be argued that transfer of knowledge in decision-making processes, patterns of policy change and innovation, selection of technologies, and so on, are largely determined by institutional identities.

Table 1 shows the main characteristics of these different social institutions. It is the interaction, including tensions, between these actors that function as means of retaining inter-agency relations and promoting co-operation. Formulated governmental policies are thus the results of conflict resolution as means of harmonizing development process and achieving perceived objectives. In this regard, adjusting sectoral policies can be viewed as an instrument for accomplishing commitments, and for resolving conflicts among involved parties and between groups of actors and institutions.

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Table 1: Characteristics of Social Institutions

	Environmental NGOs	**Governments**	**The Private Sector**
Characteristics	Social Critique	Bureaucracy	Commercialization
Main Interests	Defend Local Interests, Ideology/User Interests Engage in Politics	Control of Resources Retention of Power	Profit Maximization Market Expansion
Priorities	Poverty Reduction Natural Resource Conservation Environmental Protection	National Economic Development National Security	Market Share Risk Minimization
Instruments	Monitoring Lobbying Public Debate Media Reporting Environmental Impact Assessment	Negotiation Financial Control Political Pressure Expropriation Regulation Incentives	Bidding Accounting Cost-benefit Analysis

At the international level, actors can be broadly grouped into three categories: international agencies, national governments, and NGOs. At the national level, actors can be divided into six categories: governmental bureaucratic organizations, the scientific community, public-owned industrial organizations, private sector organizations, environmental protection agencies, and the non-governmental sector. Different social and cultural identities and conflicting interests constitute the interactions among these actors, as they are represented by groups of people from various backgrounds and professional disciplines.

These interactions affect political decision-making processes, within which environmental policies are formulated and implemented. As a counter-measure to minimize the risks caused by conventional supply-oriented policies, alternative policies are developed to argue for programs, such as energy conservation, renewable energy technology development, and agroforestry.

Networks play a critical role in facilitating communication and co-operation between organizations. Actors usually interact through a web of networks, formally and informally. Networking can be understood as an important means of promoting co-operation between institutions, and of keeping balance in power relations. Through networking activities, institutions come to share specific knowledge or information, and establish consensus to reach specific objectives.

To what extent a network can function effectively depends on a number of variables, including relationships between key actors involved, political interest of individual actors, design of communication focal points, a common knowledge base. It can be argued that the ability to build up a reliable and effective network is a decisive factor for cost-effective management of international aid programs (Gan, 1995, pp.18-21). Establishing network of institutions is key in implementing environmental agreements, as in other development

projects and programs. In many cases, conflicts between aid agencies and governmental organizations lead to ineffectiveness in project management and implementation. In particular, closer co-operation between international aid agencies and their counterpart organizations at the national level would facilitate more effective management of joint programs.

Once policy objectives are established, effective measures are needed in order to use different policy instruments to achieve expected environmental objectives. There are sets of options available for choosing policy instruments. Clearly, the performance of environmental policy depends, to a large extent, upon the adoption of properly defined and constructed policy instruments.

Policy instruments are inter-linked and interact in a common political, social and cultural context. How well each policy instrument will function depends not only on internal factors such as the contents and structure of the instrument, but also on external factors such as political and social changes in a given circumstance. Moreover, choice of instruments is largely a result of political determination, despite economic, social and cultural factors.

Environmental management cannot function in isolation. It must be integrated with, or complemented by, other instruments, such as legal and technical instruments. For instance, environmental management cannot be effectively undertaken without adequate environmental information concerning the conditions or trends of environmental quality, which has to be obtained through environmental monitoring, auditing and assessment. In other words, environmental objectives cannot be properly met without adequate information and technical means, such as monitoring and accounting systems and networks.

To analyze the interplay of policy systems, an important factor should be highlighted. That is the function of a feedback loop from the process of policy implementation to policy formulation. This feedback function brings signals from different policy implementing bodies, and public reactions, to the attention of policymaking organizations, which help correct policy mistakes. Such a mechanism may release some potential social energy to transform stubborn attitudes and institutions into a self-reinforcing dynamic for change. The factors that may function in the feedback loop depend in part on the given circumstances of the country or the party involved.

In principle, local authorities may serve the same objective as promoted by central governments. However, in reality, local governments may have different motivations and pursue strategies that may be in conflict with central authorities. There are a number of problems in mobilizing local governments as feed-back mechanisms and arenas for learning. One main problem is that local governments may have interests that conflict with various kinds of reforestation efforts, or have low interest in the effort by themselves. Local governments may also be involved with particular interests to the extent that they may obstruct reforestation initiatives, favor particular interests in reforestation process, or thwart the airing of conflicts during project design process.

The existence of feedback mechanisms at the local level may imply particular advantages for foreign participants investing in reforestation as joint implementation efforts. In the absence of such mechanisms, foreign participants may find themselves in a situation characterized by asymmetrical information, in which central, or local, government has a high level of control over disseminated information at the local level.

4.2 Property Rights

There are at least three dimensions of property rights which may influence the cost-effectiveness of reforestation efforts. First, the degree of conflict between formal property rights and traditional property rights. Second, long-term security or stability of formal property rights regimes. Third, distribution of formal property rights. These dimensions constitute incentives as well as barriers for the long-term interest of various actors in participating in reforestation efforts and maintaining the sustainability of forests. Conflicts between formal property rights and traditional property rights have major implications for local populations' motivation to participate in reforestation efforts (Westoby, 1989, pp. 56-64).

Property rights provide incentives or disincentives for different stakeholders, shaping their behavior over forest resources. In theory, property rights imply the exclusive right to use, control, and receive benefits from a resource. Randall (1987, p.158) defines four criteria for a *nonattenuated* property rights regime:

1. Completely specified: information about the rights that accompany ownership, the restrictions on those rights and penalties for violation.
2. Exclusivity: the owner shall have the exclusive right to use and to determine use by others.
3. Transferability: rights must be transferable, so that rights may gravitate to their highest value.
4. Enforceability: rights must be enforceable and effectively enforced.

In practice, property rights are in most cases circumscribed by the generally accepted rules of the society. Bromley (1991) identifies four *levels* of property rights: (1) state owned property regimes; (2) Private property regimes; (3) common property regimes, i.e., private property for a group of co-owners; and 4) Non-property regimes ("open access").

From a management point of view, property rights have two important aspects: revenue collection and resource use. For a renewable resource like forest, the owner receives benefits if he or she secures the forests' existence and regeneration. Reforestation, like conservation, can be forced on local people as confiscation of what they perceive as their own land. As described later, local people may have property rights systems for land, which is described as "barren" and "degraded" by environmentalists, and "unproductive" by governments. These differences in perception of land use constitute an important social dimension in policy arena.

Confiscating land from local populations, substituting traditional property rights with formal property rights and putting land into productive use has been a main force in capitalist development over the last 200 years (Westoby, 1989). The industrial revolution was preceded by expulsions of local population from the best land, vividly described by Marx. However, in the British and other European cases, this confiscation was controlled by a very powerful and stable state in terms of territorial control, the land itself was highly interesting from an economic point of view, and there was no attention to the welfare of the local population.

All of these preconditions are, by and large, absent in present reforestation efforts in Asia. States, particularly governmental institutions, have limited capacity to intervene in social relations. This implies that confiscating land for reforestation is seldom a viable strategy, at least in the long run, which is the time perspective of reforestation. Weak states may make big investors vulnerable to enduring conflicts with local population, or conflicts between different governmental institutions. This problem is aggravated by the high risks connected to reforestation efforts, particularly in the early stage of projects. Tree plantations can easily be damaged by fire, and fire may be used as a powerful tool for resistance from local population, as has happened in Indonesia (AFP, news report, Oct.21, 1997).

Even though planted forests may produce high profits in the long run, both initial risks and investments are high, and they increase as there is no strong state with a capacity to protect the investment. Furthermore, the social and environmental consequences of displacing local people may be very negative. If alternative employment opportunities do not exist, local people may be left with the choice between low-wage work on the plantation, or increased poverty. In the absence of a strong state being able to guard forest and provide alternative employment opportunities, parts of the local population may become “shifted cultivators” and exert pressure on forests.

The second problem, which increases the risks connected to reforestation efforts, is that formal property rights may be relatively insecure. First, in cases in which the state owns the land, reforestation profits become more insecure, as the right to harvest the forest in principle may be withdrawn at any time (Mather, 1990).

Both temporary and full property rights may be insecure in many political systems, due to high political instability. New rulers may reshuffle property right systems and violate individual property rights. In cases where the basic rules of the game are so insecure and there is doubt about the enforcement of contracts, investors may be expected to stay away from reforestation in the absence of relevant economic incentives. Though high incentives may attract investors in the short run, the risk of political turmoil followed by confiscation and conversion of reforested land under a new regime may make reforestation efforts risky as investments from an environmental point of view.

An option which may imply more positive incentives for reforestation at lower cost may be to distribute formal property rights to local people in exchange for some kind of reforestation obligations. In most cases, other incentives for reforestation would also have to be applied. The amount of complimentary incentives necessary will depend on the alternative use of land, as well as security of property rights. It may be assumed that secure property rights and incentives that are higher than the alternative use of land may produce best environmental outcome.[7]

Reforestation efforts along these lines may also be less expensive, as local population may expect much less in terms of profits than large business interests. This is particularly the case if established traditional property rights are relatively evenly distributed. A complementary

[7] The distribution of property rights to rubber tapers in the Amazon region may provide an instructive case. From the late 1980s, the Brazilian government started to provide property rights to local rubber tapers in exchange for the right to exploit rubber from wild rubber trees. This system functioned well when the Brazilian government subsidised rubber prices and prohibited competition from cheap Asian rubber, but it broke down when import barriers were lifted during the early 1990s. In this period, several rubber tapers started to convert the forest for agricultural purposes or started small-scale gold mining.

advantage connected to this solution is that it demands less in terms of governmental enforcement, as the level of conflict over property rights may be more moderate. A second advantage is that a more even land distribution may be more beneficial in terms of local economic development, and motivate less marginalization and pressure on forest by marginalized local people.

Clearly, reforestation efforts need a stable policy framework over longer periods of time to become more effective and environmentally desirable. Thus, even though various property rights regimes may decrease the burden on government in terms of enforcement measures, all efforts require a long-term commitment by government to become successful in implementation.

5 Reforestation in Asia: Comparing China with Indonesia

A number of studies have investigated carbon sequestration of reforestation programs in the tropics. Brown (1996) estimates that tropical areas have 80% of the world's potential for carbon sequestration in the forest sector. Tropical Asia contributes 34% of this. Latin America has the largest potential with an estimated 46% of the tropical total.

The total estimated carbon sequestration in the tropics is found to be in the range of 45-72 GtC, more than half of which would be due to promoting natural forest regeneration and slowing deforestation. Nilsson and Schopfhauser (1995, pp.267-293) estimated that 57.7 million ha could be both suitable and available for carbon sequestration in Asia for the period 1995-2050.[8] Of this, 37.8 million ha would be for plantations and 19.9 million ha for agroforestry.

The immediate carbon sequestration benefit of reforestation is through increasing storage of carbon and soils in the planted area. Second, reforestation may affect deforestation rates in natural forests through reducing, or increasing, demand for land. Third, reforestation may reduce fossil fuel combustion, through the use of fuel woods, instead of fossil fuels, and timber instead of cement or other energy-intensive materials. The global potential for carbon offsets is calculated in chapter 24 of IPCC (1996) report.

An analysis based on potential for new growth (plantations, farm forestry, natural regeneration) and slowed deforestation, was undertaken by Trexler and Haugen (1995). They estimated that Indonesia is the tropical country (together with Brazil) with the largest potential for carbon sequestration through sound forest management. Estimates for the period 1990-2050 range between 5.4 and 14 GtC.

Johnson, et al. (1996) analyzed carbon sequestration in China by using computerized models. The analysis considered net costs of carbon sequestration from tree planting and modified forestry practices, whereby the private financial benefits are subtracted from the costs. Strategies included plantations (intensive, extensive and fuelwood) and improved management of open forests. Cost-effectiveness was calculated by dividing the net present value of each respective project by the discounted carbon sequestered in living biomass and in the soil.

The net cost analysis showed that the least-cost means of sequestering carbon in China is through intensively managed 'Fast-Growing, High-Yield' (FGHY) timber plantations, with internal rates of return above 12% in 10 out of 12 cases, depending on different species (Johnson, et. al, 1996). Extensive plantations and open forest management were less attractive, but also low-cost options. Fuelwood plantations, although promoted by the Chinese government to reduce the adverse impact of fuelwood collection on natural forests and timber plantations, were found to be financially viable only in southern China, whereas much of the land available for forestry development is in the north and northwestern regions. It is noted that at the true market price or opportunity cost of fuelwood, this could be an economically attractive option.

[8] Of the total area in the tropics that is *technically suitable* for afforestation, only 6% is to be *available* due to land use conflicts involving cultural, social and economic constraints (Nilsson and Schopfhauser, 1995).

The total carbon sequestration potential by plantations in China, including intensively and extensively managed plantations, fuelwood plantations and open forest management, range from 2.4-4.6 billion tons of carbon in woody biomass and soil over a thirty-year period, or an average of 80-153 million tons of carbon per year (Johnson, et al., 1996). Under the high scenario, carbon sequestration in the year 2020 will be 220 million tons of carbon, about 10% of baseline GHG emissions from China in that year. Since the late 1980s China has planted trees roughly at the rate of the medium scenario.

One reason for selecting these two countries as a comparative case study is that forests in China and Indonesia account for 50% of the total forest resources in the Asia/Pacific region. Reforestation efforts in these two countries will have significant impact on the region as a whole. It will also have significant implications in terms of mitigating global climate change. Our focus will be on reforestation of tropical forestry lands. We want to study and compare regions in these two countries with similar geographic and climate situations, but different political, economic and institutional settings.

The intention is not only to investigate proper means for public sector involvement, but also to compare options for private sector participation, especially from industrial sectors. It is anticipated that great interest from the private sector would be mobilized by national commitments on CO_2 emissions reduction in developed countries, and increasing interest from developing countries.

Indonesia has remained a high interest in getting involved in JI efforts, while China has so far been reluctant, or suspicious, in making political commitments on JI/AIJ, although a small JI project has been implemented with investment from Japan (Harvey and Bush, 1997, p.18). However, we cannot rule out the possibility that China may become actively involved in JI efforts in the future, because of its increasing role as a net CO_2 emissions contributor, and potential international pressure for GHG emissions reduction. China's domestic concerns with the threat of climate change to its ecosystems will also drive the country toward a pro-active attitude in its climate change policy.

China has a relatively strong science and technology infrastructure in the forest sector, and has also established a sophisticated network of forest management nationwide, which provides a precondition for sound forest management. But past experiences have shown that China meets a lot of difficulties in keeping its forest resources sustainable. Many reforestation projects have failed, or not been able to reach expected objectives (Shi, 1992, p.23). Many blame technical and financial problems involved, but no systematic efforts have so far been made to analyze the institutional issues for sustainable forest management.

China contributed to 11% of the global CO_2 emissions by 1991, and may become the world largest CO_2 emitter early in 21st century (Sinton, et al., 1996, p.VIII-2). Apart from the increasing domestic demand for forest products, China's commitment to reduce CO_2 emissions and anticipated international pressure could lead to drastic changes in China's forest policy to encourage sustainable forest development. The key issue will be how to mobilize public interest for active involvement in protection of forest resources and development of new forests. To reach this objective, adjustment of policy frameworks and instruments would be necessary.

One important factor in forest management in China is the heavy involvement of state-owned logging companies that are responsible for large-scale loss of forest. Most of forest

lands are publicly owned by the state. The separation of private ownership from forest lands puts pressure on forest resources, because of illegal logging and the inability of sustainable forest management by public institutions. There are increasing private initiatives on reforestation, due to the encouragement of governmental policies and incentives. By contrast, private logging companies in Indonesia take the lion's share in forest operation. These companies have serious conflicts of interest with local residents. These issues will make the comparative study interesting, as both countries have different systems of governance in forest resources.

5.1 Status of the Forest Resources

Table 2 shows the forest resource situation in Asia. China is the single largest developing country in Asia, where economic reforms have provoked drastic changes in society with higher demand for consumption of natural resources. These factors have affected the sustainability of forest resources, and put pressure on world market, i.e., import of wood products. China's efforts to stabilize and reduce CO_2 emissions will be an important contribution to the international community because of its intensive use of energy resources, of which demand for fuelwood is the main contributor to deforestation (about 70%) in rural areas.

Table 2: Forest Cover in Asia

Country /Region	Land area (1000 ha)	Total forest, 1995 (1000 ha)	Share of land area (%)	Natural forests (ha)	Total change in forest area, 1990-95 (ha)	Annual change, 1990-95 (%)
Indonesia	181 157	109 791	60.6	103 666	-5 422	-1.0
China	932 641	133 323	14.3	99 523	-433	-0.1
Tropical Asia	846 839	279 766	33.0	255 751	-15 275	-1.1
Total Asia	2 676 909	414 172	17.7	n.a.	-16 640	-0.7

Source: FAO (1997). n.a.: not available

5.1.1 China

China has a total forest area of some 133 million ha, covering about 14% of the country's land area and accounting for 28% of Asia's forest area (FAO, 1997; Kunshan, et al., 1997). Natural forests cover about 99 million hectares or 75% of the total. There is a great variety of forest types in China, with coniferous forests in the north, deciduous broad-leaved forests in the temperate zone, evergreen broad-leaved forests in the subtropical zone and rain forests in the tropical zone. During 1990-1995, China had an estimated annual loss of total forest cover of about 0.1%. Since 1949 large reforestation campaigns have been implemented to reduce China's deficit in wood resources. These have not been able to stop

the decline of natural forests, due to low survival rates of new plantings, high demand for fuelwood and, especially after 1979, rapid increase in timber logging (Smil, 1993).

Decline of forest cover in China dates back to long before the modern era (Richards, 1990, pp.169-171; Menzies, 1994). After the People's Republic of China was founded in 1949, massive reforestation campaigns were implemented. Official sources indicate that total forest cover increased from 8.6% in 1950 to about 12% in 1980, due to extensive reforestation programs. However, this figure may be overstated due to incomplete data for 1950 and low survival rates of the new plantings (Jinchang, et al, 1988; Smil, 1993).

High deforestation rates and massive land degradation are reported after 1949 (Smil, 1987, 1992). Smil (1987, p.219) estimates forest losses of 20 million ha between 1949 and 1980, almost one-third of which could be attributed to felling of forests for grain fields. According to the 1990 Forest Resources Assessment by the Food and Agriculture Organization (FAO), China lost on average 400,000 ha of natural forests during the 1980s, but this was offset by an increase in plantation area of about 1.1 million ha per year (FAO, 1995). Smil (1993) presents less optimistic figures, reporting a decrease in China's forest area of 12,8 million ha or nearly 10% in the 1980s, and wood harvests for all uses 40% above the sustainable rate.

China has a serious deficit in wood resources. Forest resources amount to only 0.1 ha per capita, less than one-sixth of the world average. China is the third largest consumer of forest products in the world, and at current rates of exploitation, the stock of commercial forests will be exhausted within ten years (Johnson, et al., 1996). Per capita consumption of commercial timber is, however, only 0.05 m^3, about one-fortieth of the U.S. per capita consumption and far below world average consumption of 0.65 m^3 (Ross, 1988; Smil, 1993). Major obstacles to increase the domestic supply of wood resources include low survival rates of new plantings, low productivity, and wasteful wood utilisation (Smil, 1993). With the implementation of the reform and the open-door policy over the last two decades there has been a large increase in China's imports of forest products.

Hainan Island is one of the two major regions of tropical forests in China.[9] It was reported that tropical forest cover in Hainan was 15 million ha in 1950 and it was reduced to 0.3 million ha by 1979, which is only 2% of the original forest area (Shi, 1992, p.23). However, deforestation estimates vary greatly. Zhongmin and Guangyi (1996) report a loss of about 0.55 million ha of natural tropical forests on Hainan Island between 1950 and 1990. Guangyi (1995) calculates a mean annual loss of 2% or 34,000 ha from the eve of liberation to the present, almost two and a half times higher than the above figure. An even higher deforestation estimate is given by Li (1995), who reports an annual average deforestation rate of up to 11.5% during 1933-1990, and that only about 8% of the original forest cover remain.

Several factors have contributed to the decline of natural forests in China. Direct causes include fuelwood collection and conversion of land to agriculture plots, enhanced by large population growth. On Hainan Island, Zhongmin and Guangyi (1996) report that more than 30% of the deforestation from 1950 to 1990 could be attributed to slash-and-burn agriculture. In new plantings, pest infestation represents a major problem, causing economic losses equalling to the state's total investment in forestry (Smil, 1993). Other major problems

[9] The other is Xishuangbanna in Yunnan Province.

are inadequate prevention of fires, industrial development (plantation establishment) and urban expansion.

Underlying this, state policies have had a large influence on forest destruction. After 1949 there was an expansion of agriculture into mountains and marshes. This expansion was given strong ideological support. "The Great Leap Forward" movement in the late 1950s resulted in increasing forest destruction and land degradation (Ashton, 1984, pp.613-645)[10]. A huge program for iron and steel making required large amounts of charcoal from forests and poor quality coke from open-cut mines. After "The Great Leap Forward" movement, China implemented a "grain-first" policy, which called for maximum local self-sufficiency in cereal production. In many regions extensive conversion of grasslands, bushlands and forests was the only way to increase grain harvests (Smil, 1987).

5.1.2 Indonesia

Indonesia has about 103 million ha of natural forests (1995), which represents 40% of the tropical forests in Asia. Other estimates of forested lands in Indonesia in the late 1980s and 1990s range from 92 million ha to 120 million ha (Sunderlin and Resosudarmo, 1996). Estimates for annual deforestation range between 0.2 and 2.4 million ha. A commonly cited figure for the period 1980-1990 is 1.2 million ha (FAO, 1995), while FAO (1997) estimates the rate for the years 1990-1995 at 1.0%.[11]

The forest sector is an important contributor to the Indonesian economy. Indonesia is one of the world leaders in the export of tropical timber, notably plywood (Sunderlin and Resosudarmo, 1996). In 1994, wood and wood products produced about US$ 5.5 billion in export revenue, or about 15% of the total export revenue. Processed wood products are Indonesia's second-highest source of foreign exchange after oil and gas. About 700 000 people are employed in the formal forest sector. As the result of the ban on roundwood timber export in 1985, there has been a rapid development of the processing industry and pulp production has risen sharply over the last few years.

Deforestation connected to large-scale logging and agricultural expansion on the "Outer islands", particularly in Sumatra, Kalimantan and Maluku, is the largest source of carbon dioxide emissions from the country. Deforestation and forest depletion also contribute to local and regional environmental problems, such as water pollution, soil erosion, and smoke from annual forest fires. The recent forest fires in Indonesia have damaged large forest areas. Recent estimates indicate that more than 2 million hectares may have been burned.[12] These incidents reflect the need for sustainable forest management, and for rehabilitation of the damaged forest areas.

Main *direct* causes for deforestation in Indonesia include logging, land clearing for plantation establishment, and slash-and-burn cultivation. Other factors are mining, irrigation and hydroelectric projects, and urban expansion. Deforestation increased dramatically with the boom in the logging industry in the mid-1960s, which, to a large extent, was caused by increasing timber demand from Japan (Brookfield, et al., 1995). Two other major factors for deforestation are the Transmigration Programme that began in the mid-1970s, and the more

[10] cited by Smil (1987).
[11] For further discussion on deforestation estimates, see e.g. Angelsen (1997, p.107).
[12] See Pearce, F., *New Scientist*, 21 March 1998.

recent expansion of plantations of oil-palm, rubber and timber (Myers, 1991). Over the last decade there has been a change in view on the causes for tropical deforestation. Slash-and-burn cultivation is given less of the "blame" for deforestation than was the perception a few years ago (Sunderlin and Resosudarmo, 1996).[13]

Problems in government policies and institutions have been considered the underlying causes of deforestation in Indonesia. This includes policies and institutions both within and outside the forest sector. Gillis (1988:43) states that deforestation in Indonesia "would have been less rapid had government policies had more neutral effects on tropical forest land use decisions". It is clear that poverty is a major driving force for the destructive forms of slash-and-burn cultivation. Examples within the forest sector are short logging concession periods and weak enforcement of regeneration regulations, land use or ownership rights that are obtained by clearing of lands, and subsidies for plantation establishment on natural forest lands. Examples of non-forest policies affecting forest management are resettlement (transmigration) schemes, general tax and agro-conversion policies, fuel subsidies, and exchange rate policies (Gillis, 1988).[14]

Despite uncertain figures, there is little doubt that given the current trends, a large part of the natural forests in Indonesia will disappear within a few decades. It is also clear that a certain level of deforestation is unavoidable in the development process in Indonesia. Myers (1991) estimated that "planned deforestation" (and thus desired by the government) in Indonesia, comprising timber concession areas, forest areas allocated for conversion to agriculture, and spontaneous settlers, could eliminate 20 million ha during the 1990s. Even in cases where forest clearing could be desirable, the use of fire for clearing has disastrous consequences when at a scale observed in the fall of 1997.

5.2 Reforestation Programs

5.2.1 China

Large afforestation programs were implemented in China after 1949. According to the Forestry Yearbook of China (Kunshan, et al., 1997, p.27), the area of afforestation undertaken annually by the State since 1949 has ranged between 27,400 ha (1950) to 6,022 million ha in 1994. FAO (1995) estimates the 1990 plantation forest area at 31.8 million ha.[15] Kunshan, et al. (op.cit.) reports that the plantation area in 1994 was 34.3 million ha. Jiankun, et al. (1996, pp.249-253) estimate that man-made forests will cover about 40 million ha in the year 2000. Plantations have been established to secure the supply of forest products, to combat desertification, to rehabilitate degraded lands, and to reclaim desert lands into new farmland.

[13] In Indonesia, the official view seems to have undergone changes, but a remaining problem is that the government does not distinguish between "traditional" and "modern" forms of slash-and-burn cultivation. It is well documented that traditional slash-and-burn cultivation, given the abundance of lands and low population density, is an ecologically sound practice. Traditional practices are often called shifting cultivation to separate it from the destructive sides of the practice seen in areas with high population pressure and scarcity of land areas. (See *New Scientist*, November 15, 1997).

[14] For more discussion on this issue, see also Angelsen (1997).

[15] This is similar to Jiankun, et al. (1996), which report the 1990 figure to be 30.7 million ha of man-made forests in China. No source is given for this number.

Past efforts for afforestation have only led to partial success, and many projects failed as a result of low survival rates or low productivity, due to lack of proper care after plantation, and conflicts of institutional objectives. The Ministry of Forestry has stated that no more than one-third of all China's plantings since 1949 have managed to survive. Jinchang, et al. (1988) reports an overall survival rate of only 30% since 1950. A survey by the Northwest Institute of Forestry in Xian from the 1980s, cited by Smil (1992), indicated that "half of reported national afforestation claims were false, and that the survival rate of planted trees was no higher than 40%."

It has been argued that disincentives in pricing, management and marketing have hampered expansion of forest resources. One problem concerns ownership and management: "Lacking both direct ownership and management influence over standing timber, state forest industry units had few incentives to facilitate regeneration" (Jinchang, et al., op.cit, p.214). Another major problem has been disincentives in the pricing system. The planned prices were set too low to reflect real costs. Retail prices remained constant from 1955 to 1972. Even in 1979, prices in China were 50% lower than in the world market. This gave growers too little incentives to invest in forestry, the industry too little incentives for efficient utilisation, and resulted in wasteful consumption patterns. Narrow price differentiation with species, quality and size worked in the same direction.

China has set up an ambitious plan for afforestation as reflected in the "China Cross-Century Green Engineering Plan". By the year 2000, 57 million hectares of forests will be planted through afforestation and reforestation projects. Therefore, potentials for afforestation under JI are high, particularly with private sector participation. In order to reduce China's deficit in forest products, several policy changes have been implemented. Changes are seen in pricing systems for woods and wood products (Jinchang, et al., 1988), and land use policy (China News Digest, April 29, 1998).

China has large plans for increasing both quantity and quality of the forest resources. The government's goal is to expand forest cover to 15% of its land base by the year 2000. According to Kunshan, et al. (1997), total afforestable land in China now amounts to 63 million hectares, of which 14.1 million ha are suitable for timber plantations. Fast-growth and high-yield plantations (FGHY) are set up as a priority.

The afforestation program for the FGHY afforestation program was initiated in the mid-1980s. According to Johnson, et al. (1996) more than a quarter of the plantations established in China since 1985 has been FGHY. Plantation establishment is planned to serve several purposes. For example, it is stated that "wild land and wasteland will be eliminated in 21 provinces, autonomous regions, and municipalities by 2000, in the whole country at large by 2100" (Kunshan, et al., 1997, p.25).

5.2.2 Indonesia

Afforestation programs in Indonesia have been called reforestation if on government land and regreening if on private lands (Gillis, 1988). A variety of such programs have been going on since independence in 1946. Today, governmental interests are increasing, as natural forest resources have become scarce. Increasing efforts are put into government afforestation schemes, primarily for securing the timber industry with raw material.

One government program being conducted to attract private investors is the Industrial Timber Estates (HTI). HTI was established in the early 1980s to promote reforestation of

degraded lands (including compensating for the failure of logging concessionaires to secure regeneration after logging), and to ensure an adequate long-term supply of raw materials for the domestic wood processing industry (MoF and FAO, 1990).

Priority areas for HTI plantations are the vast areas of human-induced *Imperata* grasslands, resulting from deforestation followed by frequent burning. Invasions of Imperata cylindrica (alang-alang) or other infestive weeds often hamper regrowth of forest after heavy logging or land clearing in Indonesia. In Indonesia alone, large-scale *Imperata* grasslands cover at least 8,6 million hectares (Dalfelt et al., 1996). To promote reforestation of such lands, a set of financial incentives is offered to potential investors, funded by royalties from the logging concessions.

As with other rehabilitation programs, HTI has so far not been very successful, neither in attracting private investors nor in securing the maintenance of planted areas. Implementation of the afforestation programs has been hampered by factors such as technical difficulties, lack of local manpower and social resistance (Dalfelt et al., 1996). Institutional conflicts have also created inadequate conditions for efforts to eliminate deforestation. For example, inadequate property rights may lead to conflicts between local residents and large companies. It has been suggested that huge reforestation incentives motivate large forest companies to clear-cut their forest concessions in order to become eligible for reforestation funds (AFP, Oct.21, 1997).

This implies that even if the technical difficulties related to reforestation were resolved, there might be serious institutional barriers connected to the use of reforestation as a JI measure. The problems connected to traditional property rights as well as the abundance of internal Indonesian funds for reforestation are special challenges. The weakness of the policy framework for sustainable forest management both at the local and national levels also creates obstacles for project implementation.

5.3 Property Rights

5.3.1 China

Ross (1988, p.82) analyzed three forms of ownership management in China's forest sector: state (bureaucratic-administrative), collective (campaign-exhortation), and private (market-exchange). It is concluded that "each form has advantages and drawbacks related to common property resource management, incentives, and free-rider effects". However, while both state and collective ownership in principle had several advantages over private ownership (planning, economies of scale, favoured access to investment, and highly skilled work force), the author states that the advantages proved illusory in practice.

Private forestry was virtually eliminated in the 1950s, but several changes occurred due to the economic reform promoted by Deng Xiaoping in the late 1970s (Jinchang, et al., 1988; Ross, 1988). In 1978, two new forms of private forestry systems were introduced: extension of private plots to forestry and development of the contract responsibility system. Private farm plots had earlier been a rather constant part of the rural economy, but had not been common in forestry. In addition to the general bias towards collective ownership of natural resources, the authorities viewed privatisation and small-scale operations to be incompatible with sound forest management. Changes in policy were, according to Ross (1988), due to

dissatisfaction with the slow pace of collective afforestation and high costs of state forestry. "As in farming, the collective retained land ownership, but households were granted the right to cultivate the land for their own needs or, within limits, to market the products" (Ross, 1988, p.69). Forestry lands consisted of sloped wastelands and were distributed on an equal per capita basis.

The private plots were the lesser of the two forms of privatisation introduced in 1978 (Ross, 1988). In the contract responsibility system, the collective community (usually at the village level) also retains ownership but contracts with households/workers to manage the lands over a period of 15-20 years or for the expected life of a stand. In return, contractors receive some proportion of income from the forests or woodlots and rights to other income and commodities produced with the land.

By establishing a direct link between responsibilities, rights and rewards, it was hoped that households would acquire a strong, direct interest in developing forestry. Ross (1988, p.83) reported problems with overcutting and disputes over property rights, but "the reformers argue that they are due to the traumas of policy transition and uncertainty over the stability of the new policies". Johnson, et al. (1996) notes that "the quality of management by collectives and individuals is generally low, since they have had limited access to advanced silvicultural techniques and since most face financial constraints." It is further stated that "(…) household forest farms continue to be characterised by low productivity and minimal adaptation of improved silviculture techniques."

Ross (1988, p.84) concludes that "a regime whose policy is more profit oriented and based on incentives is likely to benefit not only timber production but also conservation". The author adds, however, that "for improvements to occur (…) the state must provide improved infrastructural supports, [including] continued political stability; a greater pool of capital for investment credits (…); assured access to grain for areas specializing in forestry, including subsidies where necessary; higher producer prices and freer markets; improved technical services; fire and pest protection; crop insurance (…); and security against rapacious local governments that threaten to tax the profit out of forestry".

In the 1980s, roughly a quarter of the total forested lands was transferred from the state to the households as part of the household responsibility system (Johnson, et al., 1996). Jinchang, et al. (1988) reports that by 1985, households were conducting over 50 percent of an expanding volume of afforestation around China. In the arid Northwest region, households were assuming responsibility for soil conservation measures, receiving subsidies for implementation of unprofitable efforts. After 1978, there have also been increasing efforts in demarcation and enforcement of property rights. Before 1978, non-enforceable rights "greatly impeded forestry development". Rights are inheritable and can, to a limited extent, be sold or transferred among individuals. Currently, 45.3% of the forest resources in China are under State ownership, with the rest under collective ownership. Among the area of "economic forests", collective ownership dominates (90%), but the stock volume is largest on state lands (70% of standing stock volume). (Kunshan, et al., 1997).

5.3.2 Indonesia

The Indonesian government has property rights to all natural forests through provisions in the Constitution of 1946. Rights may be transferred to private, individuals or corporations, either temporarily for 20 to 25 years as with timber concessions, or irrevocably to

transmigration families (Gillis, 1988). The Basic Agrarian Law (BAL) in 1960 deals with regulations of ownership, utilisation and reservation of land, water, air, and associated natural resources. Commonly cited areas of disincentives for forest management in Indonesia include the following: conflicts between formal and traditional rights, enforcement problems, problems with the concession/policy regulations per se, and disagreements among government agencies.

The formal ownership arrangement has given rise to conflicts with local populations, who arrange their land use according to customary laws. These are "unwritten, customary rules of the indigenous population" (GOI/IIED, 1985). Much of the forest land in the Outer Islands, although perhaps not forested, has not yet been demarcated and is still managed under local *Adat* law[16] (GOI/IIED, 1985). The general perception on traditional land rights by Indonesian authorities is that they have faded away and are no longer relevant (Evers, 1995). Only traditional land rights that were formally declared before the BAL of 1960 are accepted. Conflicts arise when lands are distributed to plantation/logging companies or transmigration programmes.

Even if traditional rights are recognised in theory, they are in practice overridden and little or no compensation is given to farmers losing lands (Lohmann, 1996; Sedjo, 1987; Dalfelt, et al., 1996). Even large-scale grasslands, officially described as "unused wastelands" often have some sort of traditional rights connected to them. Putting fire to plantations on these lands has been one way of showing social protest.

In Indonesia, differing aims of government agencies have had negative consequences. There are at least six government departments that directly affect tropical forest utilisation in Indonesia. Gillis (1988) notes that "[c]oordination of policy toward forest utilization between the six departments has been virtually absent until recent years, and sporadic at best since then". The author argues that the narrow views of each of these departments have had destructive consequences. Especially the protective functions of the forests have been neglected. The Forestry Department has focused on the extraction of wood resources, the Transmigration and Public Works Department tends to see forests as a place for relocating transmigrants, the Department of Industry as a source of raw materials for plywood mills, and so forth.

The lack of enforcement of forest regulations in Indonesia presents another constraint. Logging or plantation companies may undertake activities outside their concession area, they may not pay logging rents and taxes, and they commonly do not regenerate forests after logging, as prescribed in the concession agreements. Companies may also undertake logging or establish plantations within areas where local communities have the formally accepted property rights, or within protected areas. Lohmann (1996) reports that Department of Forestry admits that as much as 86% of concession holders violate government logging rules. Government agencies have too low capacity to restrict slash-and-burn cultivation in protected forest areas. Logging and plantation companies are also involved in complex patron-client networks with the government, leading to a *de facto* acceptance of regulation violations.

The laws and regulations themselves also give disincentives in terms of forest management. For example, as land clearing in many cases is a way for small holders to obtain and maintain

[16] Adat is an Indonesian law on Customary Land Rights.

their land use rights, land conversion is encouraged. For logging areas, concession periods of 20-30 years are generally regarded as being far too short (and the extension procedures too insecure) to give long-term management incentives. Perhaps worse, however, is that large subsidies are given to companies that want to establish plantations in logged over forest areas. Newly logged forest areas are much more attractive for plantation establishment than, for example, large-scale grasslands, because of aggressive weeds, low soil fertility, and high fire frequency of the latter. One company can in this way obtain high profits through logging concessions, and later obtain large subsidies to clear lands and establish plantations (Lohmann, 1996).

6 Conclusions

To promote reforestation in developing countries requires a better understanding of the institutional conditions that shape the development and implementation of JI projects. The paper stresses the need for studies on the institutional conflicts and barriers to implementation of JI projects on reforestation. As far as carbon sequestration is concerned in international climate negotiations, developing cost-effective mechanisms that fit into local circumstances for joint implementation is of particular importance.

This paper highlights the importance of research on reforestation in Asia, with particular emphasis on property rights regimes and its relationship to joint implementation and concerned social groups and institutions. It points out the interrelationship of implementation mechanisms, methodologies and criteria for project development, and the roles of various stakeholders in project implementation, with China and Indonesia as two illustrative and comparative cases.

We see property rights as a critical dynamic factor in affecting the attitudes and active participation of local people and communities in the operation of JI projects. In the process of investigating property rights mechanisms, we consider the relationship of environmental NGOs, governments and the private sector as an important steering mechanism in setting up cost-effective property rights regimes. This relationship is conditioned by a number of variables: characteristics, interests, priorities, and instruments of involved parties.

China and Indonesia have large potentials for reforestation. Their future participation at the JI/AIJ scheme would have large impact at the forest sector as well as in their socio-economic systems. The past experiences of reforestation projects in China and Indonesia indicate the need for proper policy intervention before any investment decision is made and implemented. The following issues are considered important for future research:

(1) **Conflicts among stakeholders:** There often exist conflicts of interest between various stakeholders with regard to reforestation activities. Differences between formal property rights and local (traditional) property rights are a common source of conflicts in afforestation projects, e.g., between logging/plantation companies and farmers/local communities.[17] Conflicts arise when traditional rights are not legally recognized by government, and local communities do not receive any form of compensation for loss of lands to plantations.

(2) **Long-term security or stability of property rights regimes:** A well-known problem in promoting reforestation projects is the capacity of institutions to secure property rights. Even if land-use conflicts are resolved, weak or politically unstable states often give little long-term security for property rights, and consequently few incentives for private investment in land-use. In this situation, investors face higher risks in reforestation projects, due to uncertainty in return of investment.

(3) **Distribution of property rights:** reforestation projects could be more effectively implemented if property rights are distributed to local communities. Arguments are that

[17] For example, in Indonesia, it is known that even large-scale grasslands, which are officially considered as "empty wastelands", there are well established, informal land tenure arrangements (Turvey, 1994; Van Noordwijk, et al., 1995).

level of conflicts would be lower, it would require less enforcement, it would be beneficial in terms of economic development, and it could lead to more ecologically diverse reforestation strategies. It is unclear, however, how external factors for carbon sequestration would affect distribution of property rights.[18]

(4) **Information exchange:** sufficient information exchange and effective use of information to adapt to experiences are key requirements for any management system to succeed. This means that inefficiencies are discovered and necessary changes are put into practice.

It is our suggestion that the social and human dimensions in design and implementation of JI/AIJ projects and programs have, to a large extent, been ignored. This is not surprising, as social scientists have generally been slow in responding to global climate change research (Gan, 1995, pp.7-11). In particular, they have not made substantial contributions to research on JI/AIJ, due to the complex nature of the problems involved in host developing countries. It is also by no means clear about private sector's involvement in JI/AIJ activities and how closer co-operation could be made between parties and local participants. This is partly because of the uncertainties in policy incentives provided by host developing countries. Qualification of institutional conditions for JI/AIJ at host countries would be a great challenge for researchers.

It is reasonable to ask in what ways cost-effective mechanisms can be established and implemented in host countries, which can generate pro-active responses from local communities and relevant stakeholders. Moreover, adequate methodologies and criteria for designing, monitoring and evaluating projects need to be formulated. Financial and legal mechanisms that meet local circumstances and particular needs, and at the same time satisfy the interests and objectives of national governments, international aid agencies, and private investors, should also be established.

Our main hypothesis is that institutional aspects represent a missing linkage in climate change mitigation studies with relation to the forest sector. Institutions shape development trajectories, and the lack of focus on this aspect has several implications for design and implementation of projects. This in turn may give unexpected and unwanted - yet largely unknown - overall effects. The following questions are considered important in formulating and directing future research:

(1) What are the underlying institutional conditions that affect the design and implementation of reforestation programs?
(2) Who are the main actors involved in forest management, and which are their respective roles and motivations?
(3) To what extent and in what ways do property rights affect the cost-effectiveness of reforestation efforts?
(4) What policy instruments can be developed or improved to facilitate reforestation programs?
(5) What are the relevant institutional frameworks and/or arrangements to be used in JI for reforestation programs? And what institutional changes would be brought up through such programs?

[18] It is reasonable to expect that e.g. plantation companies would use climate change mitigation benefits to promote their own interests in acquiring land areas.

It is our wish that a new research agenda can be established and implemented, through which a better understanding of the institutional roles in shaping reforestation projects/programs in developing countries can be achieved. For doing so, interests from the scientific community and support from funding agencies for such an initiative are needed.

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Appendix: Definition of Terms

Institutions
By institutions, we refer to the security and distribution of property rights on various user groups, rules for acquiring land for reforestation, and the magnitude and structure of other reforestation incentives. Institutions also include channels for response and criticism from local populations and environmental NGOs to the government agencies that regulate and coordinate reforestation efforts.

Institutions can be seen as elements that constitute the relationship among individuals and groups in society. Oran Young (1989a) defines institutions as “Social practices consisting of easily recognised roles coupled with clusters of rules or conventions governing relations among the occupants of these roles. The rules that link institutionalised roles and, therefore, form the superstructure of institutions ordinarily encompass sets of rights or entitlement as well as behavioural prescriptions.” In our study, institutions refer to security and distribution of property rights, rules for acquiring land for reforestation, magnitude and structure of reforestation incentives, and channels for response and criticism from local people and environmental NGOs to government agencies. To a larger extent, laws and regulations over property rights are determinants in practice in land use.

Afforestation and Reforestation
Afforestation is here used as the establishment of forests on non-forested lands, regardless of whether these lands have ever been covered by forests or not. *Reforestation* is used when lands have been cleared in recent times, while rehabilitation refers to a situation with degraded environmental conditions. Turvey (1994, p.52) defines afforestation as "the process of planting trees to improve soil fertility, community well-being and wealth, and maintaining or improving biodiversity of the landscape." Afforestation may also be applied to cases where natural regeneration, and not plantation, is the most efficient way to establish forests. Planting trees could be implemented in a variety of ways, from monoculture forest plantations to highly diverse and complex agroforestry systems. In this study, we use reforestation as a broader term to cover all the above mentioned aspects.

Carbon Sequestration
The term carbon sequestration describes the process of carbon uptake and storage. This refers to carbon dioxide (CO_2) uptake through photosynthesis and storage of carbon in vegetation, soils, and wood products. However, indirect effects on carbon emissions, e.g., on deforestation rates and combustion of fossil fuels, should also be accounted for.

In contrast to temperate and boreal, the largest share of carbon in forests tropical forests is stored in above-ground biomass. Below ground, carbon occurs as living root biomass, in humus or in the soil mineral component.

Forests absorb CO_2 through the photosynthesis and store carbon in biomass. CO_2 is released through decomposition of organic material. In tropical forests, as opposed to temperate and boreal forests, the largest share of carbon is found in above-ground biomass. Below ground, carbon occurs as living root biomass, in humus or in the soil mineral component.

Growing forests have net absorption of CO_2, while mature natural forests are regarded as being in a steady state, i.e., that uptake through photosynthesis equals releases through respiration. A recent study from the Amazon basin indicates, however, that year-to-year variations in the carbon fluxes may be larger than earlier thought (Grace, et al, 1995, pp.778-780).

Joint Implementation (JI) and Activities Implemented Jointly (AIJ)

"Joint Implementation" refers to the 1992 United Nations Framework Convention on Climate Change (FCCC), which states that "Parties may implement (…) policies and measures jointly with other Parties". The principle implies that countries with high emission reduction costs (typically industrialised countries) may invest in greenhouse gas (GHG) reduction efforts in low-cost countries (typically developing countries), thereby obtaining credits for achieved emissions reductions.

There is considerable discussion both about JI as an implementation mechanism and its applicability to afforestation and reforestation in tropical countries. Under the FCCC negotiations, a pilot phase for JI efforts is now in progress (1995-1999). These efforts are referred to as Activities Implemented Jointly (AIJ). AIJ projects in the forest sector are being implemented in countries, such as Costa Rica, Mexico, and Indonesia. The future development of JI will, to a larger extent, depend on the experiences from the pilot phase.

This is CICERO

CICERO was established by the Norwegian government in April 1990 as a non-profit organization associated with the University of Oslo.

The research concentrates on:

- International negotiations on climate agreements. The themes of the negotiations are distribution of costs and benefits, information and institutions.
- Global climate and regional environment effects in developing and industrialized countries. Integrated assessments include sustainable energy use and production, and optimal environmental and resource management.
- Indirect effects of emissions and feedback mechanisms in the climate system as a result of chemical processes in the atmosphere.

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